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FOREST PEST MANAGEMENT

3430 BIOLOGICAL EVALUATION
R2-81-5

DIPLODIA TIP BLIGHT OF
PONDEROSA PINE IN THE BLACK HILLS,
SOUTH DAKOTA

OCTOBER 1981

United States
Department of
Agriculture

Forest Service

Forest Pest Management
Denver, Colorado

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INTRODUCTION

Diplodia tip blight, incited by *Diplodia pinea* (Desm.) Kickx, was first reported on ponderosa pine (*Pinus ponderosa* Laws.) in the Black Hills of South Dakota during July 1979 (2). During June 1980 (3) and July 1981, additional surveys were conducted to determine the distribution of the disease throughout the Black Hills and to evaluate the potential impact of the disease on tree growth and survival. An aerial flight was made in July 1981 over plots established in 1980 (3) to determine if the disease could be detected from the air. These surveys were conducted by Drs. D. W. Johnson, Supervisory Plant Pathologist, Forest Pest Management, and G. W. Peterson, Plant Pathologist, Rocky Mountain Forest and Range Experiment Station, Lincoln, Nebraska; and W. G. Telfer, formerly Forest Pest Specialist, South Dakota Division of Forestry, now Entomologist, Forest Pest Management, Albuquerque, New Mexico.

METHODS

Field examinations of symptomatic ponderosa pines were conducted along major highways throughout the Black Hills in 1979, 1980 and 1981. Necrotic tissues, including cone scales, twigs, needles and dead buds from symptomatic trees, were examined for fungal fruit bodies. In addition, second-year cones were collected in areas where trees were free of shoot infection to determine if *D. pinea* colonizes older cones and is a common saprophyte as well as parasite of ponderosa pine in the Black Hills.

Samples were collected from sites throughout the Black Hills and isolated in culture to confirm the identity of the causal agent. Positive identification was based on the presence of both pycnidia and spores typical of *D. pinea*.

Photo plots were located in two areas to follow progress of disease symptoms over several seasons and to determine short term effects of *D. pinea* on tree vigor and survival (3). Data recorded for trees included d.b.h., age, presence of cones, and disease rating. The disease rating was a modification of that used for dwarf mistletoe (1). The crown was divided into thirds and each third rated as heavy, light, or non-infected (3). Disease ratings were recorded in 1980 and 1981 and compared. To determine the effect of the disease on tree vigor, increment cores were taken at d.b.h. on one side of the tree. The number of rings for the last radial inch of growth was determined. The number of rings within the last 0.5 inch of growth and the previous 0.5 inch were compared.

RESULTS AND DISCUSSION

Presence of *Diplodia pinea* was confirmed in several locations scattered throughout the Black Hills (Fig. 1, Table 1). The best indication of *D. pinea* infection, in most cases, was the presence of pycnidia on cone scales. As previously reported, the disease appeared most damaging on open-grown trees with numerous cones (2, 4, 6). The fungus was not found on cones in any areas where trees were free of shoot infection.

Heavily infected trees were readily detected from the air. It is recommended that annual flights in the Black Hills include observations for incidence of *D. pinea* as well as mountain pine beetle.

Affected trees were located mostly in openings and along the edge of stands. Severely affected trees had numerous dead branches. Tree mortality was uncommon. Individual tree infection varied greatly, as evidenced by trees in photo plots (Table 2).

The scattered nature of the disease throughout the Black Hills suggests the fungus has not been introduced recently, but may be native. Weather conditions prior to 1978 may have played a significant role in the apparent recent damage caused by *D. pinea*. The disease may have become more apparent when the fungus moved into older tissues from new shoots as a result of moisture stress during the 1977 drought in the Black Hills. Disease severity has lessened somewhat since the 1979 season as indicated by disease ratings of trees monitored in the two sites (Table 2). The average disease rating of the four study trees at the Rockerville plot was 3.25 in 1980 and dropped to 2.25 in 1981 (Table 2). The average rating of trees in the Pennington County plot was 3.57 in 1980 and 3.14 in 1981. During the survey the disease was found to be less apparent in 1981 than in previous years.

Comparison of increment cores from heavily infected trees (disease ratings of 5 and 6) with cores from noninfected trees did not reveal any impact of the disease on growth rates (Table 2). However, impact on growth increment may be expressed over a longer period.

The disease does not appear at this time to be increasing in severity or distribution. Since the disease is more severe on open-grown trees with large cone crops, it poses no threat to most established managed stands in the Black Hills. The disease, however, could be a threat in areas to be regenerated, if these areas are near infected cone-bearing pines. High value trees in developed recreation sites and around homesites can be protected by application of chemical sprays (4). Spray schedules have been developed during the past few years and are quite effective.

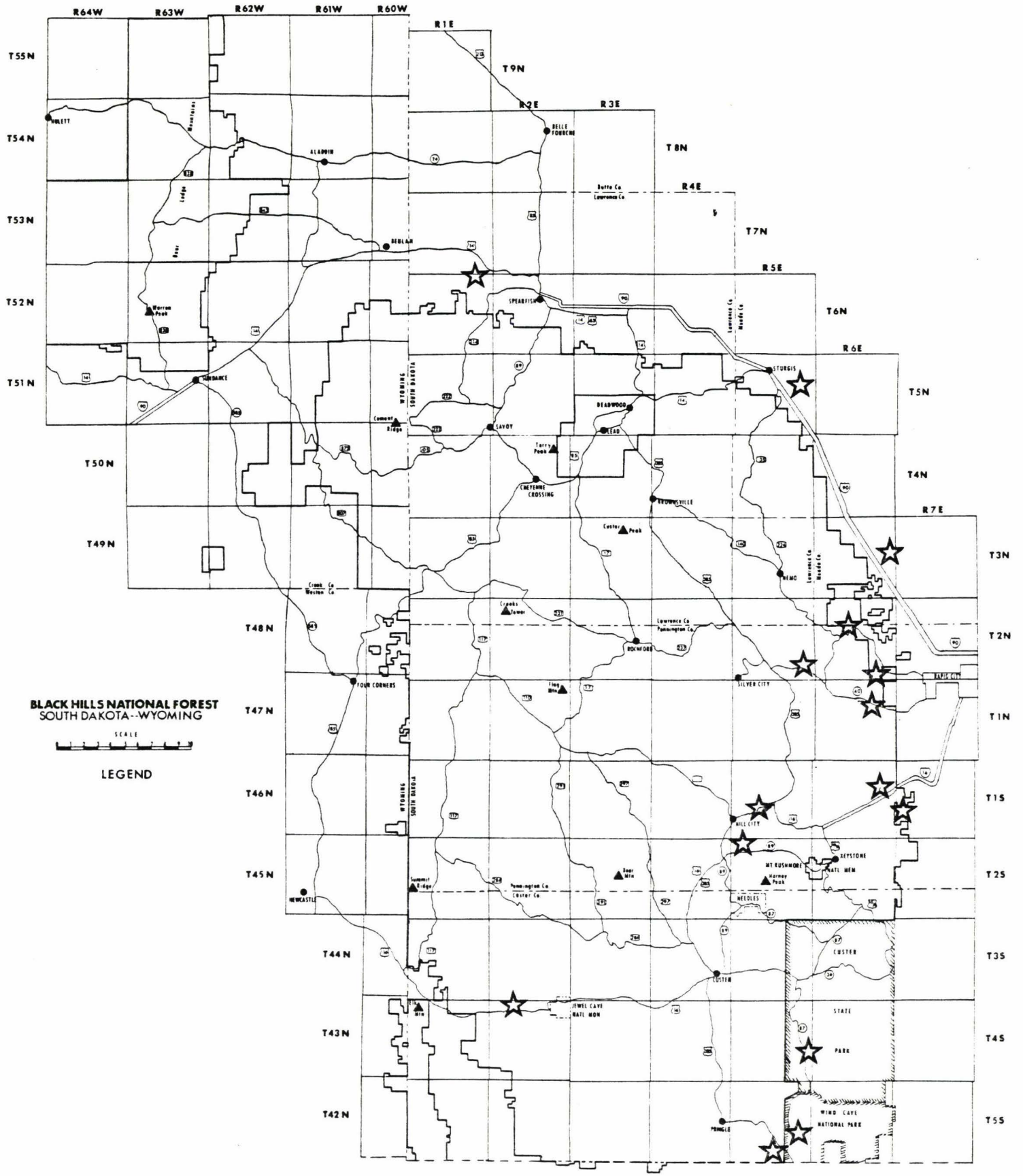

Figure 1. Locations of *Diplodia pinea* infected ponderosa pine in the Black Hills, South Dakota - 1979-81 ☆

TABLE 1. Legal descriptions of sites where ponderosa pine were examined for *Diplodia pinea* (1979-81)

Sites where *D. pinea* was confirmed

Rockerville	T. 1 N., R. 5 E., Sec. 10
Rockerville	T. 1 N., R. 6 E., Sec. 13
Nemo Road	T. 2 N., R. 6 E., Sec. 36
Pactola Work Center	T. 2 N., R. 5 E., Sec. 16
Petrified Forest Campground	T. 3 N., R. 6 E., Sec. 12
Fort Meade	T. 5 N., R. 5 E., Sec. 14
Higgins Gulch	T. 7 N., R. 1 E., Sec. 36
Bavers' Camping, Hill City	T. 2 S., R. 4 E., Sec. 1
Teepee Work Center	T. 4 S., R. 2 E., Sec. 6
Cold Spring Creek	T. 5 S., R. 5 E., Sec. 28
Battle Mountain	T. 7 S., R. 6 E., Sec. 18

Sites where *D. pinea* was not confirmed

Slate Prairie	T. 1 N., R. 3 E., Sec. 36
Irish Gulch	T. 2 N., R. 3 E., Sec. 11
Strawberry Ridge	T. 4 N., R. 4 E., Sec. 7
Custer Peak-Hwy. 385	T. 3 N., R. 4 E., Sec. 17
Nemo Area	T. 3 N., R. 5 E., Sec. 27
Jim Creek	T. 2 N., R. 5 E., Sec. 10
Little Spearfish Creek	T. 4 N., R. 1 E., Sec. 16
Brownsville	T. 4 N., R. 4 E., Sec. 30
Crow Creek	T. 6 N., R. 1 E., Secs. 9, 15, 16, 22
Lookout Peak	T. 6 N., R. 2 E., Sec. 12
Robinson Flats	T. 7 N., R. 2 E., Secs. 3, 4, 10, 11, 13, 14
Reno Gulch	T. 1 S., R. 4 E., Sec. 35
Needles Area	T. 2 S., R. 5 E., Sec. 6

TABLE 2. Disease rating and growth increment for selected ponderosa pine in plots, Black Hills, South Dakota

Tree No.	Disease rating 1980	Disease rating 1981	No. rings last radial inch	No. rings last 0.5 inch	No. rings previous 0.5 inch
Rockerville Plot					
1	6	5	11	6	5
2	5	2	12	6	6
3	0	0	15	7	8
4	2	2	11	6	5
Total	13	9	49	25	24
Ave.	3.25	2.25	12.25	6.25	6.00
Pennington Co. Plot					
1	6	5	12	6	6
2	4	3	11	7	4
3	3	3	16	8	8
4	6	5	14	6	8
5	0	0	12	6	6
6	0	0	11	7	4
7	6	6	23	9	14
Total	25	22	99	49	50
Ave.	3.57	3.14	14.14	7.00	7.14

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